Hazard Assessment of Roads

on the

Yakima Training Center

Need for Assessment

- Over the past 10 years 34 tactical vehicle accidents have occurred at YTC
- Fourteen of these accidents have occurred in the past 24 months
- Two accidents involving one fatality have already occurred in CY02
- Increased concern with IBCT NET training ready to begin in June 02

Summary of Accident Data

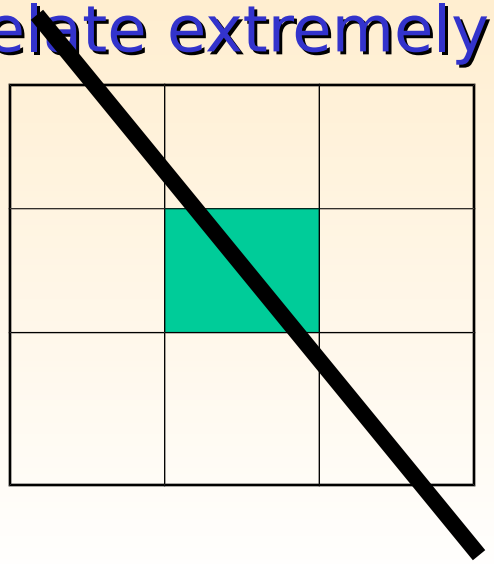
- 34 accidents involving tactical vehicles in the past 10 years
- 5 accidents resulted in fatalities and 2 resulted in permanent disabilities
- 27 accidents occurred during daylight hours
- 7 accidents occurred during winter months (November through March)
- 16 accidents occurred on MILCLASS 4 or 5 roads or during off-road maneuvers

Road Hazard Assessment

- Goal: Identify site conditions most likely to result in serious injuries or death when a vehicle unexpectedly leaves the road
- Primary roads were assigned a risk hazard code based on slope analysis conducted utilizing YTC's GIS computer system
- The assessment evaluated MILCLASS 2 and 3 roads (459 miles)
- Roadways were placed in one of six risk hazard categories

Hazard Analysis Protocol

-GIS data for YTC is available at 10 meter resolution
-Slope for the area adjacent to the roadway was calculated by determining the average change in elevation between the road surface and 8 surrounding points
-Each pixel (10 sq. meters) crossed by a MILCLASS 2 or 3 road was assigned a numeric value related to slope
-Results of the analysis correlate extremely well with known field conditions



Road Hazard Categories

- Class 1- Average slope 0 to 7 degrees
- Class 2- Average slope 8 to 20 degrees
- Class 3- Average slope 21 to 30 degrees
- Class 4- Average slope 31 to 40 degrees
- Class 5- Average slope 41 to 50 degrees
- Class 6- Average slope > 50 degrees

Summary of Slope Analysis

Hazard Code	Length of Road by Hazard Code (miles)	Roads Marked (miles)	Roads Unmarked (miles)
1	39.83	0.20	39.63
2	167.13	6.00	161.13
3	109.34	3.38	105.96
4	76.09	3.47	72.62
5	40.72	1.68	39.04
6	25.58	4.52	21.06
Total	458.7	19.25	439.45

Proposed COA

- Provide training units access to map of YTC showing road hazard information
- Continue with YTC safety briefs/make attendance mandatory
- Place reflective markers at 30 meter intervals along both sides of high risk roadways
  - High risk roads include those assigned hazard codes 5 and 6 based on slope analysis
  - 30 meter interval was field verified using NVGs to ensure suitable visibility under field conditions at night
  - Marking 60 miles of roads will require installation of approximately 6500 reflective markers

Cost Evaluation

Option	Type of Reflective Marker	Unit Cost for Materials	Total Cost for Materials	Visibility Rating (1=Best)	Ease of Installation (1=Best)
1	Carsonite Post	$8.85 ea	$57,525	3	4
2	T-post with 3 in. reflector	$2.90 ea	$18,850	2	3
3	T-post with 4ft. PVC & 2” band of reflective tape	a) $8.25 ea b) $3.00 ea	$53,625 $19,500	1	1
4	T-post with 2” band of reflective tape	$2.25 ea	$14,625	4	2

Proposed Marking Devise

- 2 inch PVC pipe with reflective tape placed over T-post
- Good visibility night and day
- Visible through NVGs
- Easy to install
- High durability

Labor Requirements

- Cost estimates on previous slide are for materials only and does not include labor
- Estimated manpower to install markers is 2000 man-hours
- Labor Source Options
  - Contract
  - Troop Labor
  - Temporary Civilians

Other Actions in Place to Reduce Road Hazards

- Warning Signs at Exit 11 and RC/FWD
- Steep Grade signs throughout area
- 25 MPH speed limit for tactical vehicles
- 35 MPH speed limit for all other vehicles
- On-going road maintenance activities
- Limited MP patrols down range
  - MP augmentation to increase patrols

Questions ?